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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/580,815	05/25/2006	Hiroyuki Kotani	10921.406USWO	7407

52835 7590 07/21/2009

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EXAMINER	
BAUER, SCOTT ALLEN	
ART UNIT	PAPER NUMBER
2836	
MAIL DATE	DELIVERY MODE
07/21/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/580,815	KOTANI ET AL.	
	Examiner	Art Unit	
	SCOTT BAUER	2836	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 May 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-14,31-40,45,50 and 55* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14, 31-33, 38-40, 50 & 55* is/are rejected.

7)☒ Claim(s) *34-37 and 45* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *25 May 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

This action is in response to Applicant's election of species dated 05/06/2009. Applicant elected Species II which was related to Fig. 4 and claims 8-14. Applicant argued however that claims 1-7 also read on Specie II. The Examiner agrees and as such will examine Species I and Species II as an invention drawn to Species II would also read on claims 1-7 of Species I.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. Claims 1, 2, 4, 5, 7, 31-33, 38 & 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishii et al. (US 6,311,638) in view of Kuriyama (WO 03/037047).

It is noted that US 7,301,286 granted to Kuriyama was used as an English language translation as it is related to the above cited reference.

With regard to claim 1, Ishii teaches a high-frequency power supply system for supplying high-frequency power from a high-frequency power source (4) to a load (32) via an impedance matching unit (41), the system comprising: a first detector (56) for

detecting information about a forward wave traveling from the high-frequency power source toward the load; a second detector (53) for detecting information about a reflected wave traveling from the load toward the high-frequency power source; a calculating device (63) for calculating a change of a magnitude of reflection coefficient per unit time at a detection point provided for the first and the second detectors based on the information about the forward wave detected by the first detector and the information about the reflected wave detected by the second detector (column 3 lines 53-column 4 line 26); and an anomaly determiner (7) for determining an occurrence of an anomaly on a side toward the load as from the detection point provided for the first and the second detector based on the change of the magnitude of reflection coefficient per unit time calculated by the calculating device (column 6 lines 53-61).

Ishii does not teach that the change in the magnitude of the reflection coefficient is carried out by a differentiator.

Kuriyama, in Figure 1, teaches a system for detecting an arc in a glow discharge device wherein a reflection coefficient is determined. Kuriyama teaches that a rate of change can be determined by feeding a signal into a differentiator (4).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Ishii with Kuriyama, by using a differentiator to determine the rate of change of the reflection coefficient in the arithmetic unit of Ishii, for the purpose of providing a simple and cheap manner of determining the rate of change that consists of two well known circuit elements as Ishii states that a rate

of change in the reflection coefficient can be used to determine a fault but does not show how the calculation is made.

With regard to claims 2, 4, 5, 7, 31-33, 38 & 39 Ishii in view of Kuriyama discloses the device of claim 1, and further discloses that the anomaly determiner determines the occurrence of anomaly when the change of the magnitude of reflection coefficient per unit time exceeds a first predetermined reference value (Ishii, column 6 lines 12-17) **(re claim 2)**, further comprising a calculator (Ishii 63) for calculating a magnitude of reflection coefficient at the detection point (51) provided for the first and the second detector based on the information about the forward wave detected by the first detector and the information about the reflected wave detected by the second detector, wherein the anomaly determiner determines the occurrence of anomaly on the side toward the load as from the detection point of the first and the second detector based on the change of the magnitude of reflection coefficient per unit time calculated by the differentiator and the magnitude of reflection coefficient calculated by the calculator (Ishii, column 6 lines 12-17 & column 6 lines 53-61) **(re claim 4)**,wherein the anomaly determiner determines the occurrence of anomaly when the magnitude of reflection coefficient exceeds a second predetermined reference value and the change of the magnitude of reflection coefficient per unit time exceeds a first predetermined reference value (Ishii, column 6 lines 12-17 & column 6 lines 53-61) **(re claim 5)**, wherein the detection point provided for the first and the second detectors is inside the high-frequency power source, in a transmission line from a high-frequency power outputting end of the high-frequency power source to a high-frequency power inputting

end of the impedance matching unit, or inside the impedance matching unit (the point is taken from the transmission line between the power source and the impedance matching circuit) **(re claim 7)**,further comprising an output power changer for changing an electric power outputted from the high-frequency power source in a decreasing direction upon detection of an occurrence of anomaly by the anomaly detector (Kuriyama column 4 lines 24-38) **(re claim 31)**, wherein the output power changer zeroes the electric power outputted from the high-frequency power source upon detection of the occurrence of anomaly by the anomaly detector (Kuriyama column 4 lines 24-38) **(re claim 32)**, further comprising an output power resumption unit for bringing the electric power outputted from the high-frequency power source back to an original amount after a lapse of a first predetermined time from upon the change made by the output power changer on the output power (Kuriyama column 4 lines 24-38) **(re claim 33)**, wherein the information detected by the first detector is a power value of the forward wave and the information detected by the second detector is a power value of the reflected wave (Ishii column 3 line 53-column 4 line 26) **(re claim 38)**, wherein the information detected by the first detector is a voltage value of the forward wave and the information detected by the second detector is a voltage value of the reflected wave (Ishii column 3 line 53-column 4 line 26) **(re claim 39)**.

2. Claims 3 & 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishii in view of Kuriyama as applied to claim 1 above, and further in view of Edamura (JP 2003-173973).

An English language translation of Edamura is provided with this action and any teaches cited are referenced to this translation.

With regard to claim 3, Ishii in view of Kuriyama teaches the device of claim 1.

Ishii in view of Kuriyama does not teach that the anomaly determiner includes a counter for counting the number of times when the change of the magnitude of reflection coefficient per unit time exceeds a first predetermined reference value, and determines the occurrence of anomaly when the number of times counted by the counter exceeds a predetermined norm number.

Edamura teaches a device to detect an abnormal plasma discharge wherein the reflection coefficient is observed. Edamura further teaches that a circuit is used detect an abnormal discharge and determines if the discharge is stable or abnormal by measuring the discharge at a series of fixed times for a set time period and determining an abnormal condition when this time period is met (para 0020-0021).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Ishii in view of Kuriyama with Edamura, by counting a number of times that the change in reflection coefficient exceed a threshold to determine a fault, for the purpose of preventing a stable discharge from shutting the device down.

With regard to claim 6, Ishii in view of Kuriyama and Edamura discloses the device of claim 4, and further discloses that the anomaly determiner includes: a first

counter for counting the number of times when the change of the magnitude of reflection coefficient per unit time exceeds a first predetermined reference value; and a second counter for counting the number of times when the magnitude of reflection coefficient exceeds a second predetermined reference value; and determines the occurrence of anomaly when the number of times counted by the first counter exceeds a first predetermined norm number and the number of times counted by the second counter exceeds a second predetermined norm number (Ishii teaches that both the magnitude and change in magnitude can be used to determine a fault and Edamura teaches that a counter can be used to ensure that a false trip does not occur).

3. Claims 8, 9, 11, 12, 14, 40, 50 & 55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishii in view of Kuriyama and Hayashi (US 2002/0188367).

With regard to claim 8, Ishii in view of Kuriyama teaches a high-frequency power supply system for supplying high-frequency power from a high-frequency power source (4) to a load (32) via an impedance matching unit (41), the system comprising: a first detector (56) for detecting information about a forward wave traveling from the high-frequency power source toward the load; a second detector (53) for detecting information about a reflected wave traveling from the load toward the high-frequency power source; a first differentiator (Kuriyama, 4) for calculating a change per unit time of a magnitude of reflection coefficient at a detection point provided for the first and the second detector based on the information about the forward wave detected by the first

detector and the information about the reflected wave detected by the second detector; and an anomaly determiner (7) for determining an occurrence of an anomaly on a side toward the load as from the detection point provided for the change of the magnitude of impedance per unit time calculated by the second differentiator.

Ishii in view of Kuriyama does not teach a third detector for detecting an input voltage to the load; fourth detector for detecting an input current to the load; a second differentiator for calculating a change of a magnitude of impedance per unit time as viewed from a detection point provided for the third and the fourth detectors toward the load based on the input voltage detected by the third detector and the input current detected by the fourth detector or that the anomaly determiner determines the occurrence of an anomaly provided for the third and the fourth detector based on the change of the magnitude of reflection coefficient per unit time calculated by the first differentiator.

Hayashi, in Figure 5, teaches a device for detecting an abnormality in a plasma processing chamber but detecting a change in the impedance of the device. Hayashi teaches a third detector (20a) for detecting an input voltage to the load; fourth detector (20b) for detecting an input current to the load; a second differentiator (as taught above Kuriyama teaches that the change in magnitude can be provided by a differentiator) for calculating a change of a magnitude of impedance per unit time as viewed from a detection point provided for the third and the fourth detectors toward the load based on the input voltage detected by the third detector and the input current detected by the fourth detector or that the anomaly determiner determines the occurrence of an

anomaly provided for the third and the fourth detector based on the change of the magnitude of reflection coefficient per unit time calculated by the first differentiator (paragraph 0100-0103).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Ishii in view of Kuriyama with Hayashi, by also including the impedance detecting circuit of Hayashi into the system of Ishii in view of Kuriyama, for the purpose of detecting a fault in the system when the impedance changes as well as when the reflection coefficient changes thus providing a great level of system production and redundancy should one of the one detector systems fail.

With regard to claims 9, 11, 12, 14, 40, 50 & 55, Ishii in view of Kuriyama and Hayashi discloses the device of claim 8, and further discloses that the anomaly determiner determines the occurrence of anomaly when the change of the magnitude of reflection coefficient per unit time exceeds a first predetermined reference value (Ishii column 6 lines 53-61) and the change of the magnitude of impedance per unit time exceeds a third predetermined reference value (Hayashi para 0100-0103) **(re claim 9)**, further comprising a calculator (Ishii 63) for calculating a magnitude of reflection coefficient at the detection point provided for the first and the second detectors based on the information about the forward wave detected by the first detector and the information about the reflected wave detected by the second detector, wherein the anomaly determiner determines the occurrence of anomaly on the side toward the load

as from the detection point of the third and the fourth detectors based on the change of the magnitude of reflection coefficient per unit time calculated by the first differentiator (Ishii column 6 lines 53-61), the magnitude of reflection coefficient calculated by the calculator (Ishii column 6 lines 12-17) and the change of the magnitude of impedance per unit time calculated by the second differentiator (Hayashi para 0100-103) **(re claim 11)**, wherein the anomaly determiner determines the occurrence of anomaly when the change of the magnitude of reflection coefficient per unit time exceeds a first predetermined reference value, the magnitude of reflection coefficient exceeds a second predetermined reference value and the change of the magnitude of impedance per unit time exceeds a third predetermined reference value (as explained above) **(re claim 12)**, wherein the detection point provided for the first and the second detectors is inside the high-frequency power source, in a transmission line from a high-frequency power outputting end of the high-frequency power source to a high-frequency power inputting end of the impedance matching unit, or inside the impedance matching unit, the detection point provided for the third and the fourth detectors being in a transmission line from inside the impedance matching unit to the load (the point is taken from the transmission line between the power source and the impedance matching circuit) **(re claim 14)** , further comprising an output power changer for changing an electric power outputted from the high-frequency power source in a decreasing direction upon detection of an occurrence of anomaly by the anomaly detector (Kuriyama column 4 lines 24-38) **(re claim 40)**, wherein the information detected by the first detector is a power value of the forward wave and the information detected by the second detector is

a power value of the reflected wave (Ishii column 3 line 53-column 4 line 26) **(re claim 50)**, wherein the information detected by the first detector is a voltage value of the forward wave and the information detected by the second detector is a voltage value of the reflected wave (Ishii column 3 line 53-column 4 line 26) **(re claim 55)**.

4. Claims 10 & 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishii in view of Kuriyama and Hayashi as applied to claims 8 & 11 above, and further in view of Edamura.

With regard to claim 10, Ishii in view of Kuriyama and Hayashi teaches the device of claim 8.

Ishii in view of Kuriyama and Hayashi does not teach that the anomaly determiner includes: a first counter for counting the number of times when the change of the magnitude of reflection coefficient per unit time exceeds a first predetermined reference value; a third counter for counting the number of times when the change of the magnitude of impedance per unit time exceeds a third predetermined reference value; and wherein the anomaly determiner determines the occurrence of anomaly when the number of times counted by the first counter exceeds a first predetermined norm number and the number of times counted by the third counter exceeds a third predetermined norm number.

As explained above, Edamura teaches a device to detect an abnormal plasma discharge wherein the reflection coefficient is observed. Edamura further teaches that a

circuit is used detect an abnormal discharge and determines if the discharge is stable or abnormal by measuring the discharge at a series of fixed times for a set time period and determining an abnormal condition when this time period is met (para 0020-0021).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Ishii in view of Kuriyama and Hayashi with Edamura, by adding the counters of Edamura to the detecting circuits of Ishii and Hayashi as described above.

With regard to claim 13, Ishii in view of Kuriyama, Edamura and Hayashi discloses the device of claim 11, and further discloses that the anomaly determiner includes: a first counter for counting the number of times when the change of the magnitude of reflection coefficient per unit time exceeds a first predetermined reference value; a second counter for counting the number of times when the magnitude of reflection coefficient exceeds a second predetermined reference value; and a third counter for counting the number of times when the change of the magnitude of impedance per unit time exceeds a third predetermined reference value; and wherein the anomaly determiner determines the occurrence of anomaly when the number of times counted by the first counter exceeds a first predetermined norm number, the number of times counted by the second counter exceeds a second predetermined norm number and the number of times counted by the third counter exceeds a third predetermined norm number (as described above).

Allowable Subject Matter

Claim 34 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims because the prior art of record does not teach or fairly suggest a device comprising all the features as recited in the claims and in combination with a matching operation stopping unit for stopping a matching operation performed by the impedance matching unit and holding operation parameters upon the change made by the output power changer on the output power from the high-frequency power source.

Claim 35 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims because the prior art of record does not teach or fairly suggest a device comprising all the features as recited in the claims and in combination with a first determination prevention unit for preventing the anomaly determiner from performing a determining operation upon determination of the occurrence of anomaly by the determiner, throughout a period of time while the output power changer changes the power output from the high-frequency power source and the output power resumption unit brings the power output back to the original amount, and further until a second predetermined time period has passed.

Claim 37 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims because it depends on claim 35

which would also be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 36 & 45 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims because the prior art of record does not teach or fairly suggest a device comprising all the features as recited in the claims and in combination with a second determination prevention unit for preventing the anomaly determiner from performing a determining operation upon commencement by a user of a power supply operation of the high-frequency power source or upon a change made by a user on an output power value setting during power supply operation, until a second predetermined time period has passed.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SCOTT BAUER whose telephone number is (571)272-5986. The examiner can normally be reached on M-F 9am-6pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rexford Barnie can be reached on 571-272-7492. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

SAB
18 JUL 09
/Robert DeBeradinis/
Primary Examiner, Art Unit 2836